# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

JC02 Rec'd PCT/PTO   01 APR 2005

In re Patent Application of

NAGULESWARAN et al.

Serial No. 10/510,473

Filed:   October 7, 2004

Title:   METHOD AND RECEIVER FOR PROCESSING A MULTI-USER SIGNAL

Atty Dkt: 3127-14

C#    M#

JC/A.U.         TBA

Examiner: TBA

Date: April 1, 2005

APR 0 1 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA  22313-1450

Sir:

## RESPONSE/AMENDMENT/LETTER

This is a response/amendment/letter in the above-identified application and includes an attachment which is hereby incorporated by reference and the signature below serves as the signature to the attachment in the absence of any other signature thereon.

☐ **Correspondence Address Indication Form Attached.**

**Fees are attached as calculated below:**

Total effective claims after amendment      **26**    minus highest number
previously paid for   **26**    (at least 20) =    0    x $50.00         $0.00 (1202)/$0.00 (2202)  $

Independent claims after amendment      **2**    minus highest number
previously paid for   **3**    (at least 3) =    0    x $200.00         $0.00 (1201)/$0.00 (2201)  $

If proper multiple dependent claims now added for first time, (ignore improper); add
                                                        $360.00 (1051)/$180.00 (2051)  $

Petition is hereby made to extend the current due date so as to cover the filing date of this
paper and attachment(s)                          One Month Extension $120.00 (1251)/$60.00 (2251)
04/07/2005 MKAYPACH 00000081 10510473            Two Month Extensions $450.00 (1252)/$225.00 (2252)
                                                 Three Month Extensions $1020.00 (1253/$510.00 (2253)
01 FC:1617                    130.00 OP          Four Month Extensions $1590.00 (1254/$795.00 (2254)  $

Terminal disclaimer enclosed, add                          $130.00 (1814)/ $65.00 (2814)  $

☐ Applicant claims "small entity" status.   ☐ Statement filed herewith

Rule 56 Information Disclosure Statement Filing Fee                      $180.00 (1806)  $

Assignment Recording Fee                                                $40.00 (8021)  $

Other: PETITION TO MAKE SPECIAL                                                    $   130.00

                                                        **TOTAL FEE ENCLOSED  $   130.00**

The Commissioner is hereby authorized to charge any <u>deficiency</u>, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140. A <u>duplicate</u> copy of this sheet is attached.

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NIXON & VANDERHYE P.C.
By Atty: Chris Comuntzis, Reg. No. 31,097

Signature: _____

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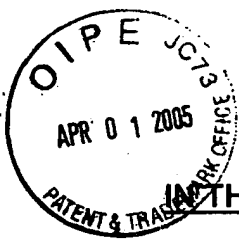
# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

NAGULESWARAN et al.                    Atty. Ref.: 3127-14

Serial No. 10/510,473                  TC/A.U.: TBA

Filed: October 7, 2004                 Examiner: TBA

For: METHOD AND RECEIVER FOR PROCESSING A MULTI-
    USER SIGNAL

             *  *  *  *  *  *  *  *  *  *  *

April 1, 2005

Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

## PETITION TO MAKE SPECIAL

Pursuant to 37 C.F.R. 1.102(d), Applicants hereby petition to make the present

application special whereby the application is advanced out of turn for examination.

The requisite fee as set forth in 37 C.F.R. 1.17(h) ($130.00) is submitted herewith.

Pursuant to §708.02 Section VIII of the MPEP (SPECIAL EXAMINING

PROCEDURE FOR CERTAIN NEW APPLICATIONS - ACCELERATED

EXAMINATION), the present application complies with each of the items identified in

that section. In particular, it is believed that the 26 claims presented for examination are

directed to a single invention. If it is determined that all of the claims presented are not

directed to a single invention, Applicants will make an election without traverse pursuant

to any restriction requirement made by the Examiner.

A pre-examination search has been carried out by way of a PCT International

Search Report (copy attached). Copies of the references cited in that International

Search Report are also attached and are listed on the attached PTO-1449 together with one additional reference located by Applicants. The Examiner is requested to initial the attached PTO-1449 and to return a copy of the initialed document to the undersigned as an indication that the attached references have been considered and made of record.

The claims of the present application are directed to an iterative TDMA receiver process, utilizing an iterative decoding algorithm for either partially or fully decoding the probabilities for each channel depending on prescribed convergence criteria, and feeding those probabilities back into the next step of the iterative process. These steps are explicitly set out in independent claims 1 and 14, and illustrated in figures 2 and 4A, 4B. It is important to appreciate the 'nested loop' nature of the claimed process, there being iterative decoder loops (partial or full decoding, e.g., by the turbo decoder) within an iteration loop of the multi-user channel estimation.

Applicants believe that the references attached hereto do not anticipate or render obvious the claimed invention. The following comments are offered.

### Learned US Publication 2002/0037061 A1

The Learned publication describes a wholly different process for multi-user detection (*"MUD"*). The method disclosed relies on providing training sequences for the received signals in order to derive the channel estimations. As the Examiner will appreciate, each training sequence is a sub-component of the received signal, used to identify each mobile user and to set up timing for the burst transmission (see paragraphs 0007 and 0027). Moreover, Learned does not involve an adaptive controller which provides for full or partial decoding of a soft signal, as required by the present invention. Instead, Learned teaches processing the received signals in a 'one-shot'

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sequential manner, and there is of course no mention in Learned of the use of soft decisions in such a process.

In contrast, Applicants' invention involves the signal processing on an iterative, continuous basis until each user signal is discriminated and can be separated out. This iterative nature of the invention, relying on soft decisions, is an essential aspect of the present invention, and is explicitly recited in the independent claims.

Learned describes a useful channel parameter estimator designed specifically for the GSM system, is <u>not</u> iterative in nature, and depends on particular channel estimation techniques (training sequences). Such an estimator does not teach or suggest the present invention.

In view of the above, it is respectfully submitted that none of Applicants' claims are anticipated or rendered obvious over the teaching of Learned. Indeed, the fundamental differences between the iterative and the non-iterative MUD approaches place Learned in a markedly different field of technology to that of the present invention.

### Frederick et al. US Pat No. 6,351,216

Frederick et al. discloses an electronic article surveillance (EAS) system in which noise reduction is effected. However, it does not solve the deficiencies noted above with respect to the Learned publication. More particularly, Frederick et al. does not teach or suggest, *inter alia*, an iterative process (or apparatus) which derives "a soft signal for a first user by subtracting, if available, weighted representations of other user signals from the detected user signal of said first user" as required by the present claims. Thus, the cited reference taken singly or in combination does not teach or suggest the present claims.

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### Valenti et al. "Iterative Multiuser Detection, Macrodiversity Combining, and Decoding for the TDMA Cellular Uplink"

Valenti et al. discloses a TDMA multiuser detection system wherein a group of base stations within a group of co-channel cells performs multiuser detection of the desired signal, originating from its cell, and the interfering signals, originating from the other cells in the group. The multiuser detector produces an estimate of a log-likelihood ration (LLR) for each mobile in the group, and the LLRs for each user are then summed across the base stations to produce a diversity combined signal.

Accordingly, the Valenti et al. system differs significantly from Applicants' invention which performs the claimed iterative process on a single TDMA channel or on two or more closely adjacent channels but does not perform any signal estimates across multiple base stations. Thus, the cited reference taken singly or in combination does not teach or suggest the present claims.

### Baccarelli et al. "A Novel Adaptive Receiver with Enhanced Channel Tracking Capability for TDMA-Based Mobile Radio Communications

Baccarelli et al. discloses a non-linear adaptive receiver for TDMA systems which employs a single channel estimator configured as shown in Figure 2. More particularly, the Baccarelli et al. system utilizes a symbol-by-symbol maximum likelihood detector "which recursively delivers reliable hard decisions and feeds a minimum mean square error (MMSE) nonlinear Kalman-like recursive channel estimator with the a posteriori probabilities (APP's) of the states of the ISI channel." Accordingly, Baccarelli does not teach or suggest the iterative process disclosed and claimed in the present application. Thus, the cited reference taken singly or in combination does not teach or suggest the present claims.
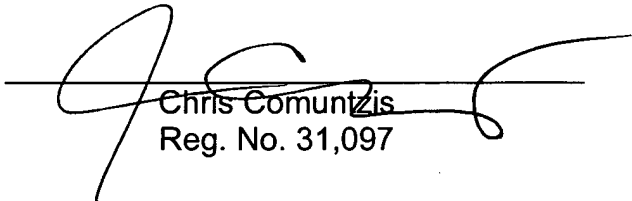
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## Conclusion

Accordingly, we submit that none of the prior art references listed in the attached PTO 1449 Form, taken singly or in any combination, anticipates or renders obvious the claims of this application.

Expedited action on the present application is earnestly solicited.

Respectfully submitted,

**NIXON & VANDERHYE P.C.**

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